OuTrop
ORANGUTAN TROPICAL PEATLAND PROJECT

Creating learning and involvement opportunities to help protect natural heritage

A report by Jack Nunn, September 2014

Introduction

About

This document explores how the public can be supported to be more involved in the work and the research of OUtrop Orangutan Tropical Peatland Project. In particular, it explores ways in which learning and development opportunities could be developed to support the involvement of the local community and the public in understanding and protecting natural heritage.

Application

This document has been written to inform the creation of a robust and long-term strategy to support learning and involvement. In particular, the document aims to inform the strategy of the OUtrop Yayasan, based in Indonesia.

Content and structure

This document begins with a **summary of conclusions**. These are explored in more detail at the end of the document.

The next section then explores in detail how **public involvement can support the work of the project** and makes recommendations for areas where this could be achieved, including involving the local community in using drones.

It then summarises **learning and development opportunities** that could support this involvement. This includes a suggested model of facilitator training that is both scaleable and sustainable and allows greater reach with local partners and a cost-effective model of capacity building.

In addition, it examines a **quality assurance model which will help support continuous improvement** of this model and measure the impact of learning and development interventions and involvement opportunities.

Such a model will allow accurate appraisal of the effectiveness of the learning and involvement work, aiding the reporting of outcomes and the impact to the local community, potential funders and the public.

The document concludes with some **recommendations and a suggested timeline of activities**.

Further Information

This report was written by Jack Nunn for the Orangutan Tropical Peatland Project OuTrop, September 2014.

Please note that in order to maintain brevity, this document summarises ideas but is not exhaustive.

If further clarification is required on any aspect, please contact Jack Nunn at jack.nunn@gmail.com or @jacknunn on Twitter.

Contents

About the language used

Here is a list which defines the meaning of some of the words and terms used in this document:

- **Local community** – a geographic term to describe people who live by or in the area of natural heritage. This will include people whose lives will be directly affected by any changes to the local environment and area of natural heritage. There may be other communities within a local community that might be defined by a common language, faith, sport or based around certain organisations such as schools. This term specifically excludes the 'international community'.

- **Public** – this term includes everyone. It extends from the local community to the international community. The word public can be helpful to distinguish from 'professionals' involved in the project (employed by it), or professional researchers. The term 'lay people' can also be used helpfully when thinking about an audience for any learning resources or communications.

- **Public involvement** – This means that work or research is undertaken 'with' or 'by' the public rather than 'to', 'about' or 'for' them. This can mean having the public involved in every aspect of the work to protect the natural heritage. Involvement encompasses engagement, participation and also means that ideas and solutions are co-created and implemented with communities and the public. Good involvement demonstrates shared control and helps ensure sustainability by ensuring all stakeholders are involved at every level.

- **Learning and development** – This is a broad term to describe any activity or opportunity which provides an individual a chance to learn or develop their knowledge or skills. While it shares many similarities with more traditional 'education' models, the emphasis is on the individual learning and sharing ideas, rather than being 'educated'. This model promotes learning that can happen in all directions.

- **Learning outcomes** – These are intended outcomes that are a result of a learning intervention. An 'outcome' or result of learning should be that the learner knows, or can do certain specific things. In this document learning outcomes will be described in a way that is measurable, for example 'be able to explain the importance of fire prevention...' rather than 'understand the importance of fire prevention'.

- **Outcomes –** These are more general outcomes from an activity, such as number of trees grown by community. This document discusses qualitative and quantitative outcomes.

- **Facilitator –** This is a term used to describe a person who has a role in helping or 'facilitating' the learning or involvement or the public. This document discusses a range of role descriptions which may help articulate different facilitator roles.

Summary

There is great potential for OUtrop to increase the impact of their work and become an international leader in developing innovative learning and involvement opportunities for the public.

The following recommendations provide clear actions which can be taken to improve public and community involvement and increase the impact of the work to protect natural heritage in the tropical peatlands of Borneo.

- A significant amount of education work has already been done by OUtrop, it is important to measure the impact of previous education work and evaluate the successes and learning points.

- Develop a draft a learning and involvement strategy for OUtrop Yayasan. Work in partnership with stakeholders and involve the community in shaping the strategy and key messages.

- Develop existing partnerships and scope new potential partner organisations with similar goals to collaborate with.

- Investigate what kinds of research the community and young people can be involved in, such as community drone projects.

- Prototype new learning and involvement models and use the learning from these to inform the final strategy, including any long-term outcome measures.

- Evaluate and measure the impact of the learning involvement over a number of years in order to share any learning about the long-term impact of the work.

Public involvement

> 'Some of the best protected forests in Kalimantan are those where the forest conservation is driven by Dayak communities and a cultural determination to stop over-exploitation of their natural heritage'
> *Helen Morrogh-Bernard, 'Protecting our Heritage Community Awareness and Education Programme',*

There are many ways to involve the local community in conserving and stewarding the local natural heritage. This can range from direct action (such as tree planting), through to becoming researchers.

This section is a summary of some ways the public could be **involved in conservation and stewardship, including research.**

It examines how the local community can get involved in

- Activities to directly support conservation work
- Fire prevention
- Research and mapping

It then examines how the **public and international community** can get involved in

- Mapping and monitoring
- Research
- Reporting impact

Finally, it examines how other **organisations and stakeholders** can

- Support the work financially or by giving time and resources
- Develop partnerships

Below is a diagram[1] of the research cycle, with the public able to be involved at each stage, including analysing results:

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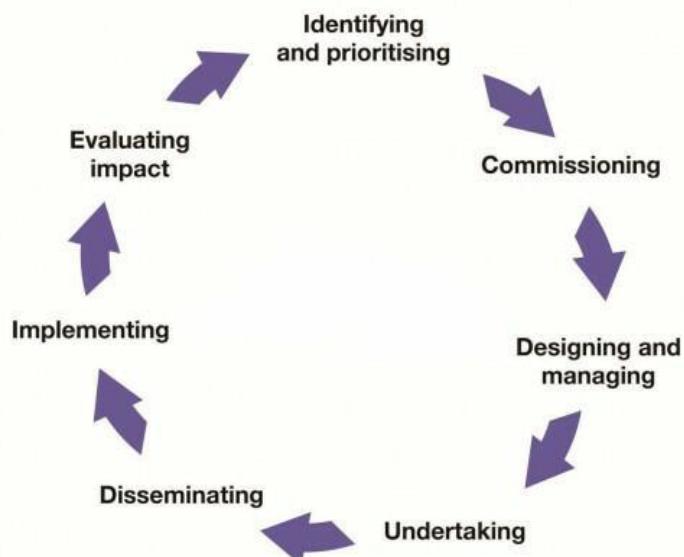
[1] 'Ways that people can be involved in the research cycle' http://www.invo.org.uk/posttyperesource/where-and-how-to-involve-in-the-research-cycle/ (accessed September 2014)

Who	What and how	Outcome
Local community	**Local activities to directly support conservation work:** • Get local people involved in tree planting by starting a community nursery in the town. This could be based at a school, but open to adults in the evening and weekends. The nursery could also prototype a programme to pay local people to grow certain trees. • Host regular events and offer invitations to the community to visit a learning and involvement events in villages and towns. In addition to permanent centres, this could include using a mobile learning and involvement centre which visits villages regularly, promoting learning about involvement opportunities. Each learning and involvement centre should offer internet access where possible. **Fire prevention:** • Members of the Community Patrol team to work with facilitators to explain their work to the local community and schools, share stories and potentially engage and recruit new volunteers, reservists or paid workers. • Formalise the role of a volunteers in the Community Patrol team and reservists by creating role descriptions which distinguish the two. For example, volunteers could expect to have a regular role in the team (e.g. one day a month), while reservists would only expect to be involved as and when needed. These role descriptions would outline support and development opportunities. • Train people in the community to use drones to help spot fires early • Hold regular events which demonstrate the work of the team, including inviting people to participate in dam building or tree monitoring.	Local people: • Report direct involvement in conservation activities • Demonstrate an understanding of their relationship with the local environment through changed behaviours. Outcome measures could include: • Number of trees grown by community • Number of people involved in helping build dams • Number of people involved in fire prevention • Number of fires spotted by the community drone project

Who	What and how	Outcome
Local community (continued)	**Local involvement in research and mapping** • Host events where researchers meet members of the local community and talk about their research and what they hope to understand or achieve with it. This could include a presentation of videos and photos of the flora and fauna, possibly using a mobile learning and involvement centre. • Host discussions where local people of all ages are invited to suggest their own research priorities and are offered appropriate opportunities for involvement in the research. • Invite school children to grow (and possibly plant) trees, and then involve them in the reporting of the progress of their tree every six months. This could involve a report for younger students and for older students and adults, a chance to come and plant, and later measure the tree. • Train local people and schools to use drones to map and photograph the forest. Work with organisations with existing expertise, such as Conservation Drones. A recent paper on using drones in communities to protect forests stated 'Data gathered through community-based forest monitoring (CBFM) programs may be as accurate as those gathered by professional scientists, but acquired at a much lower cost and capable of providing more detailed data about the occurrence, extent and drivers of forest loss, degradation and regrowth at the community scale'. Training could be relatively simple, as the paper states full or semi-automation of drones gives a 'higher degree of autonomy' meaning 'a community could begin monitoring with less training than that required by fully manual operation'	Local people are directly involved in research. Outcome measures could include: • Number of people involved in research • Number of children attending after-school clubs. • Total area mapped by community drone project Number of local people who progress to becoming volunteer researchers, paid research assistants or academic researchers.

Who	What and how	Outcome
Public	**Public mapping and monitoring:** • Support local schools to upload images and data and share with other schools around the world to help with the mapping. This could include creating a database of aerial photographs and sharing data from tree growth, dam building, fish catches and other environmental indicators. • Create a number of clear actions people can take internationally to support the work, other than giving money. • Share results and reports with other organisations in Borneo with similar aims in order to promote sharing of information and best-practice.	A sense of global ownership of world heritage. Outcome measures could include: • Number of people and schools involved in helping map and analyse data • Number of partnerships and learning exchanges formed with local and international education institutions • Number of reports co-produced by the local and international community to report to the public and potential funders.
Organisations and stakeholders	**Reporting impact and requesting support** • Use the impact data from local research and other projects to write into reports and newsletters. Send these to existing donors and fundraisers, but also use them as a tool to engage new organisations by demonstrating showing the impact that had been made. By highlighting the community involvement, supporters will know the work is sustainable. Organisations could include close links with international primary and secondary schools, encouraging a 'twinning programme' where students talk regularly online and share ideas, using common languages. • Create a number of clear actions organisations can take in addition to fundraising. For example, can higher education institutions donate the time and expertise of staff or offer services for free or give a scholarship for local people to become researchers or gain academic qualifications by working locally and using distance learning opportunities. • Work with educational organisations to create opportunities for members of their organisation to be involved in the work, possibly including formal placements. • Work with corporate partners and appropriate NGOs to offer opportunities for managers, staff and share-holders to understand the work and offer support. For example, making connections with local mining and palm-oil companies could help develop mutual understanding and a shared approach to protecting natural heritage through community involvement.	An international network of engaged organisations. Outcome measure could include: • Funding • Number of new organisations involved in the work by offering time or expertise • Number of mining and palm-oil companies working in partnership to achieve corporate responsibility goals.

Community Drones project

In the paper ['Small Drones for Community-Based Forest Monitoring: An Assessment of Their Feasibility and Potential in Tropical Areas'](), there is extensive discussion about how local community can be involved in monitoring and mapping their local area using remote controlled aerial vehicles, or 'drones'.

This way of working signals a great potential opportunity for OUtrop to prototype and pioneer the use of this technology in communities. In the appendix is an extensive summary of the key learning points from this paper which are relevant to OUtrop.

Summary of the benefits of local involvement in using drones

- Local community directly involved in drone use for improved mapping, fire prevention and asset monitoring.
- Relatively large areas can be surveyed, leading to significant time and cost savings.
- Training and development for local members of the community has been successful in other parts of Borneo, although new models need to be developed and refined.

Conclusions

The paper concludes that the primary issues that need to be carefully examined are 'the socio-cultural, political and ethical impacts of introducing this monitoring approach in communities, their relevance for community development, and the degree to which communities would need external training, assistance and funding for drone operation'.

With a small amount of planning and a modest budget, OUtrop could work to develop a prototype model of community involvement in research which would be highly effective locally, with international relevance.

Learning and development

In the document 'Protecting our Heritage Community Awareness and Education Programme', Helen Morrogh-Bernard writes that there are key elements that a successful education programme could achieve. The report also outlines a number of delivery models.

The following 'Learning and Development' section addresses ways it can be used to support involvement.

It is important to note that the final report into the pilot project 'Contributing to forest fire prevention through environmental education methods' highlighted the importance of opportunities to apply learning. It states 'there is a need for more practical training' rather than discussion by itself, and uses the example of fire prevention.

While the learning outcomes described in this document can support people to understand how to be involved, it is essential that they are clearly linked to opportunities for the public to apply the learning. Helen writes 'Intensive socialisation and community engagement is needed' and this will only be achieved with clear ways for people to be involved.

A report titled *'The economic value of peatland resources within the Central Kalimantan Peatland Project in Indonesia'* states that 'practically everybody is willing to contribute to peatland management by providing community services'. [2]

This section examines the key elements and strategies to achieve these.

'Key elements' of a successful education programme

This section contains a summary of the key elements under the headings identified in the report:

- Socialisation and awareness
- Environmental education for schools
- Open Access Education

Alongside these, learning outcomes have been articulated. In some cases, recommended activities have been included which may help achieve the aims and learning outcomes. These can range from simple structured conversations to more complex projects and actions.

Socialisation and awareness

Aim	Learning outcomes	Recommended activity
Improve understanding within the local community about the value of the forest.	• Be able to explain what the word 'value' means, including a non-economic sense.	• Ask 'what is valuable to you'. A helpful translation of this word could be 'menghargai'. Lead a five minute discussion in groups or pairs and have people write or draw what is of value to them. They may come up with as many as they like in the time given. • Ask people to sort the things they have come up with into two categories. One which can have a price in money, and one which cannot. In other words, one with 'nilai' or 'harga' and one which can only have 'menghargai'. • If the 'forest' or environment has not been chosen by someone, ask them which category they would put it in.
	• Be able to explain the value of the forest to the local community and wider world.	• Explore the ideas of 'natural heritage' and 'world heritage'. Ask people what they think these ideas mean. • Ask people to think of ways that their life is connected to the forest. For example, do they eat fish caught locally? Talk about how the forest is an important breeding ground for fish, which provide 80% of animal protein for the surrounding communities.

Improve understanding of the local community about the role they can have in protecting, maintaining and stewarding the local natural heritage	• Be able to explain who has the responsibility to protect and maintain the environment
	• Explain ways in which the community can be involved.
		• Ask 'who does the forest belong to'.
		• Discuss the concept of shared ownership and relate it to previous discussion about world heritage.
		• 'We are stewards' – Lead a discussion about all the attitudes and beliefs about the forest that people know about. For example, environmental, spiritual, financial.
		• If anyone talks about their beliefs or their families' beliefs, ask them if they would share more about it if appropriate.
		• Explore the concept of 'stewardship'. Include information about different cultural and religious attitudes to nature.
		• Use this to lead into a discussion to examine the range of attitudes to nature and wildlife and ways of understanding it. This could include:
		    ○ Discussing traditional Dyak attitudes and beliefs about the forest.
		    ○ Islamic teachings about nature, such as the passage in the

		Qur'an which discusses the duty of mankind to be 'stewards'.
		- Hindu beliefs and other relevant religious teachings. - Agnostic or non-religious attitudes and a scientific approach. - By comparing different perspectives, the learning can be that they are all helpful in different ways and in many ways complimentary - but that they can all share a desire to understand and protect the natural heritage we have. - Ask individuals to describe or explain what kind of stewardship currently takes place. - Ask them to discuss how they might be involved or support this stewardship.
	• Explain the importance of fire-prevention and how this relates to the drainage of the area canals	- Examine holistically the incentives and disincentives of the local community, and explore the idea of short term gain and long term impact. E.g. the number of people who depend on fish and the impact of the canals on the fish population. - A community drone programme, as described above, could also be used to help fire prevention. - Use other existing learning materials.

Environmental education for schools

Aim	Learning outcomes	Recommended activity
Get local schools and communities involved in conservation	• Be able to explain to family members and other community members the idea of natural heritage and ways of being involved locally.	• Give young people in schools learning resources about local natural heritage and ways of being involved. • Ask them to think about how they would explain these ideas to others. Would this include drawings, a speech, stories, games, puppet shows or drama, a leaflet or website? • Ask them to practise explaining the ideas in a way they feel comfortable. If appropriate, ask a group to work together. • Ask them to practise with family members at home, or invite parents to come and see their work. • Consider offering opportunities for young people to speak at community events or get involved in online discussions.

In addition to the environmental education for schools, there is an opportunity to get international schools and educational institutions involved. The following would be helpful ideas to explore:

• An online learning area

• Facilitated online exchanges between students both locally and internationally.

• Opportunities for students and other educational organisations to access locally collected data, carry out their own research, share results and discuss how any learning can be translated into conservation practice.

Open Access Education

The report 'Protecting our Heritage Community Awareness and Education Programme' explains the importance of creating accessible learning spaces that can be accessed by the community. In addition, the following ideas might be important:

- **Creating learning resources which are online and available for free** to anyone. By sharing these freely under an appropriate [Creative Commons](#) license, partner organisations and other organisations with shared goals may be able to use and improve on the materials. In addition, sharing a Quality Assurance framework in this way will help assess the effectiveness and the longer term impact if other users help collect and share data.
- **Creating mobile learning spaces that can be easily transported**. This addresses potential challenges for members of the community who may find a centrally based location difficult or impractical to access owing to caring responsibilities. It would also require fewer resources, as it would be able to 'tour' around. A mobile learning space could be created with minimal resources including tablet computers, portable projectors to show videos and demonstration drones to show how they can be used to carry out aerial photography.

It is also important to consider what data, if any, should be made open access to the public, in order to invite more people to analyse and interpret it. Examples of data could include mapping data, videos or data from surveys.

Delivery models

Learning and development opportunities can be created in a number of different ways. Below is a summary of three sustainable and scaleable face-to-face delivery models.

What	How
Direct delivery	Build on the existing successful pilot work, having facilitators deliver events for local children and communities. By designing interactive and discussion-based activities, learning should appeal to a number of different styles. The principles of 'Spaced learning' could be an effective model to achieve specific learning outcomes within a limited time.
Facilitator training	Train new facilitators to co-deliver and eventually deliver events in their community and beyond.
Ambassador training	Create learning resources for individuals to take back to their families and communities. Set 'Ambassadors' tasks and offer regular support, including peer support or buddying. This could include resources for children to present to their family, or resources to support local people to disseminate information about natural heritage and ways of being involved. This could also include resources targeted at a Dayak audience. This would support members of the Dayak community to talk about traditions and history and also include other perspectives such as other faiths and current scientific understanding.

Resource formats to support delivery could include:

- Printed materials
- Mobile device readable materials (such as PDF) that can be read offline.
- Videos
- Presentations
- Stories and plays
- Games

Quality assurance and reporting outcomes

By ensuring the project has a robust model of quality assurance, you will be able to continuously improve the model while also being able to demonstrate the impact. In the longer term, if successful, it could become a model which other organisations could use and adopt and the work will be able to be shared more widely as a model of best practice.

Here is a brief outline of the stages and components required to create a robust quality assurance model.

Stage	Key components
Planning	Clear strategic aims, outcomes, funding and resources should be agreed and in place. Once learning and development resources have been developed and events planned, proceed to the next stage.
Preliminary questions and registration of participants	1. Ask people to register an interest or create a register of expected participants. The latter option is more appropriate for schools. 2. Ask preliminary questions to participants, aligned to the strategic outcomes. Example questions include: • What would you like to learn? • How to you intend to apply this learning? If you want to create a baseline measure, you can ask: • Have you been involved in any conservation or research activity already? This is also a good opportunity to collect any relevant and useful monitoring information, such as age, gender, first language, ethnicity or religious beliefs. Ensure participants understand why you are asking these questions and that the information is collected and stored in accordance with relevant privacy and data protection laws. It is also good practice to ask whether people consider themselves to have a disability or any condition which means they might need support to take part in learning activities (e.g. resources in certain languages, or larger print). Ensure you ask people if you can store their contact details so you can contact them in the future for follow-up. When working with schools, ensure you have the details of a main contact with access to records.
Immediate feedback	This should ask similar questions to the first preliminary stage. This is usually filled in right after the learning (most probably on a paper form, although it can be done orally). It is also good practice to ask facilitators to complete a self-assessment.
Follow-up feedback	Using the register of past participants as a database, this is an opportunity to ask past participants questions about the learning and development opportunities after a certain amount of time has passed. Helpful questions are included in the next section.
Formal evaluation and reporting	Results from the feedback and self-assessment should be formally evaluated and reported. Learning from these findings should inform practice, and shared where appropriate.

Measuring impact

When carrying out any learning and development to support involvement, it is important not only to evaluate the learning and development itself, but also to attempt to measure if it has supported people to get involved or had an impact.

A significant amount of work has already been done with education by OUtrop, so it is important to measure the impact and evaluate what has been done already.

Some helpful questions could include:

- Was what you learned useful?
- Have you had an opportunity to apply the learning?
- After learning, did you feel there were clear actions you could take? What were barriers?
- Did you use or apply what you learned?
- Do you feel you need any support to get involved or are there any barriers? What do you need now?
- What did you do after?
- Have you been involved in any conservation work?'
- If you were to attend the learning event again, would you do anything differently, what would you have preferred?

Sustainable and scaleable

In order to make sure that learning and involvement is sustainable and scaleable, it is important to ensure that a robust development model is in place to help people learn, develop new skills and knowledge and in turn share this with others.

The final report into the pilot 'Contributing to forest fire prevention through environmental education methods' mentioned the value of having the team 'visit individual houses and gathering places'. While 'time-consuming' the impact of this kind of communication was clear. In order to make this valuable way of working more scalable, it would be necessary to train a number of local people to become 'ambassadors' and perhaps even to facilitate events.

A successful way of doing this could be to train a small number of people to be 'core-facilitators' who are able to go out into the community and facilitate events and activities. Over time and with appropriate support, the core-facilitators could become facilitator trainers. Their role would be to support and train new people to become facilitators. By using a robust and quality-assured model of facilitator training, the model will be able to support a significant number of people to develop their skills.

Below is a brief outline of what a quality-assured model of facilitator training could look like, with a suggested order of events:

1. Internally **agree the aims and outcome measures** of any learning and involvement opportunities.
2. Internally draft a **role description for facilitators**.
3. **Re-engage with existing facilitators** from the previous education pilot.
4. **Create a 'community of practice'** and run an event with them to agree:
    a. Priorities, aims and methods of delivering learning and involvement opportunities.
    b. Their role description, including time-commitments, remuneration, support offered and other legal information and boundaries.
5. **Create a resource or 'manual' for facilitators,** which includes learning resources and suggested activities. It could also include a model for training new facilitators and a quality assurance model (including resources to support evaluation and impact assessment). Please note that this document should be treated as a working document, allowing all facilitators to shape and develop it as part of a 'community of practice'. This will require someone to take responsibility
6. Collect facilitator feedback from events and **continually evaluate support and resources**.
7. Hold regular **'shared learning events' for facilitators** to share ideas and best practice.

Roots and Shoots

The 'Roots and Shoots' programme is 'a global network of young people empowered and inspired to take action to improve our world… making a difference in over 130 countries.

There is a wealth of learning from this project and any action should be informed by a thorough analysis of the successful projects which have used the resources from this work.

OUtrop could position itself as a partner in this work, and aim to become a leader in developing innovative projects, such as community drone projects.

Summary of Recommendations

Suggested time-line	Recommendation
Measure impact and evaluate previous education work	• Follow up the impact of previous education work by interviewing participants and recording outcomes in order to help evaluate the effectiveness. • Write a report outlining the impact of the learning and educational work that has taken place so far.

Develop a draft strategy	• Work in partnership with stakeholders to develop a learning and involvement strategy for OUtrop Yayasan.
	• Involve the community in shaping the strategy and key messages. Hold discussion events and present the ideas. For example discuss:
	  o The aim of this strategy should be supporting the local community to understand and implement the principles of stewardship.
	  o What is the stance on what data, if any, should be made open access to the public (e.g. aerial photography, other data) in order to invite more people to analyse and interpret data and be involved in the research.

Partnership development	• Begin to scope potential partner organisations (e.g. other local charities, Universities, UN REDD programme, Roots and Shoots). • Start a scoping exercise of what kinds of research the community and young people can be involved in (e.g. planting, tree counting, drone programmes, faecal spotting/collection for DNA analysis).
Prototyping learning models	• Create open access facilitator training and learning resources. • Train a core of facilitator trainers to work in schools and communities. • The principles of 'Spaced learning' could be an effective model to achieve specific learning outcomes within a limited time.

Prototyping involvement models	• Prototype models of local involvement. Ideas include:
	  o Starting a community nursery in the town, possibly based at a school, but open to adults in the evening and weekends.
	  o Starting a community drone project, training individuals to use technology to map the local area and for fire prevention.
	• Develop a prototype progression pathway from basic interest and engagement, through to ad hoc volunteering , towards more formal volunteering and work opportunities. These roles could include:
	  o Facilitator training
	  o Training in other ways to support OUtrop and local research
	  o Ambassador training, including Dayak ambassadors.

Establish regular outreach and involvement events	• Hold regular community events to present and discuss the work of OUtrop. This could include involvement opportunities, awareness raising, education and, if appropriate, fundraising. • Hold regular involvement events for research, where finding are presented and new ideas for research are discussed.
Finalise strategy	• Publish the strategy and invite feedback from stakeholders and other individuals and organisations.
Begin learning and involvement activities	• Being facilitator training and plan a programme of learning events • Develop a drone programme to get young people in schools and/or adults in the local community mapping the local area and uploading the results to share with other schools and communities.
Evaluate and measure impact	• Write a report outlining the impact of the learning and involvement work. • Share resources and best practice.

Conclusions

OUtrop has an opportunity to increase the impact of their work and become an international leader in developing innovative learning and involvement opportunities for the public.

The results of this work could have international relevance, if shared with international partners.

By creating a clear strategy and committing appropriate resources, learning and development opportunities could successfully support the involvement of local communities and the wider public, helping increase the impact of OUtrop's work in a sustainable and scaleable way.

Appendix

Observations and recommendations

Beliefs about the forest and spirituality

The section in the learning and development about the varying attitudes to the forest were influenced by a number of informal conversations. Beliefs and spirituality about the forest appeared to be diverse and it is therefore not helpful to generalise.

- Some workers at the camp reported different views on what their family and communities thoughts about the forest. It ranged from one man telling how his wife was scared of the forest because of stories of dangerous spirits, while others were simply cautious of the animals that live there.
- Others reported deeper family connections to living in and from the forest. One man's father was a rubber harvester and he wanted to work for OUtrop as he 'loved' being in and working in the forest.
- Some workers stated that they believed in spirits in the forest. One man told me of the houses for the spirits at the camp and that he believed in the spirits and that it's important to protect the forest. In contrast, another workers said he just believed in trees and animals he could see, but enjoyed seeing them.

Financial perspectives and workers from palm-oil plantations

Developing partnerships with corporate partners could produce effective and lasting positive impact, if done in a transparent way.

- A woman who lived in Palangkaraya introduced herself, husband and child as a Dyak. She had worked for both a mining company and a palm-oil plantation. She spoke passionately about preserving the natural heritage and was confident it could be achieved. She wished for businesses to work more effectively with charities and lamented the frustrations of corruption and certain political practices. She spoke of much good practice with mining companies and community involvement in directing investments to develop local community assets.

- Some workers at the camp joked about who had once been a logger (legal or otherwise) and many referred to a family tradition of depending on the forest financially; conservation work being simply another way of doing this.

Creating equal opportunities and demonstrating positive attitudes

- It is important to explore ways of engaging and involving women of all ages and cultural backgrounds in the work of OUtrop, as failing to achieve this will endanger sources of expertise.

- Similarly, by recognising that both men and women have to balance many things in order to be involved, such as caring responsibilities in families, it may be valuable to carry out a piece of research to interview and gather thoughts about what culturally sensitive roles men and women could have in the work, where there might be barriers and where, if and how these could be overcome.

Key learning points from 'Small Drones for Community-Based Forest Monitoring: An Assessment of Their Feasibility and Potential in Tropical Areas'

Below is a summary of the key learning points from the paper 'Small Drones for Community-Based Forest Monitoring: An Assessment of Their Feasibility and Potential in Tropical Areas', including some additional ideas and suggestions.

The original paper can be found here:

http://www.mdpi.com/1999-4907/5/6/1481

Key learning points	Relevant extract
Training and development for community members could ensure that data is collected in a cost effective way. Creating clear data management pathways will also ensure partner organisations are able to support in managing, interpreting and translating the data into actions. This could also be achieved by sharing the data through the use of open access mechanisms, involving educational institutions.	We suggest that community members would be able to autonomously plan and acquire drone imagery to monitor their forests after receiving adequate training from a partner organisation, and would be able to mosaic and visually inspect the imagery to detect forest change and other information important to the community. We would, however, expect partner organizations to undertake more complex geospatial analyses. This approach would also entail external assistance for drone maintenance and repair [96], as well as continued funding to secure drone operation by community members. [p-7]
With a clear strategic plan which sets out partnership working, this model could be highly successful.	We expect this drone-assisted CBFM approach to be particularly attractive to national and international organizations involved in REDD+ who will have the capacity to provide the necessary training, assistance and funding that communities would require. [p-7]
Detailed data can be acquired, with the local community being involved in every stage from the acquisition, interpretation to the translation of the knowledge into actions. How the data is managed should be discussed with the community and agreed in advance. There are advantages to making data available in an open way, or to partner organisations, experts can be	At this spatial resolution, specific trees and canopy gaps can be identified and easily monitored … Furthermore, forest loss, degradation and regrowth processes could be accurately detected and monitored at this level of detail by trained community members. Such data would not just be relevant for partner organizations and end-users, but also for communities themselves…. The identification of individual tree species by coupling imagery with botanical expertise, the detection of invasive plant species and pests, the

invited to provide a richer analysis.	estimation of aboveground biomass (where allometric equations exist for specific tree species)
3D modelling, while providing useful scientific data might also 'represent a meaningful way for communities to better understand different features of their territories, including their forest resources'	There is 'a possibility of producing very accurate 3-D forest models with small drones (which) would assist in the retrieval of forest structural parameters such as height, basal area, and tree density'. [p-9]
Large areas can be surveyed at a relatively small cost, especially when the resources (drones and training programmes) are shared between partner organisations.	'The ability to survey the entire community territory with a few flights suggests that small drones could lead to significant time savings in monitoring and community data analysis, particularly in the case of medium- and large-sized community territories (i.e., hundreds to several thousand hectares). [p-10] 'coupling of small drones with ground surveys (is) more cost-effective than ground surveys alone. This is particularly pertinent if payments for monitoring are involved, because significantly less time would need to be devoted to surveys (at least for medium- and large-sized community territories, i.e., hundreds to several thousand hectares), and the approach remains cost effective when the costs of training community members in drone operation are factored in. If many communities in a region wish to employ small drones, however, it may be more effective to have a single small drone owned and operated by a consortium of communities (if they exist), a regional-scale NGO that participates with the communities' [p-11]
Successful piloting of drones can be achieved by local community members after as little as 1-5 days training	The commercial drone market is increasingly targeting people with little experience flying small drones and the smallest ones are particularly easy to fly by individuals with little training, so they would be appropriate for forest community members after receiving

	specific hands-on training from partner organizations. For instance, besides pre-programming flight paths and manual drone operation (flying, landing and take-off), setting up necessary components (e.g. GPS, photo/video camera) and downloading the acquired imagery onto a computer are all relatively straightforward tasks. Also, the geotagged drone images acquired could be mosaicked or overlaid onto Google Earth by community members after training so that they could carry out visual analyses of their forests [101]. Overall, training is relatively straightforward and varies from 1–5 days (in cases where trainees are familiar with computers) to 14 days (in cases where trainees have no prior experience with computers). In practice, the skills, innate ability and motivation for these technical activities are more likely to be found amongst younger community members. [p-10]
Illegal activity could be monitored, with the technology supporting existing efforts to understand and prevent illegal logging, fires and wildlife poaching.	'Illegal timber extraction could be monitored with these systems, not only by monitoring forest cover change with time-series photography, but also by locating extraction trails and regular monitoring of the boundaries in real-time with videography [85]. Fire and illegal land-use change that alter forest cover (e.g., cropping, pasture expansion) could also be monitored timely, as could illegal exploitation of forest resources and wildlife poaching [86]. The enhanced ability of small drones to monitor illegal activities could be of great significance for communities whose land or other resources are being stolen by abutters, as is often the case in many tropical forests'. [p-11]
Create a sense of local-ownership and empowerment.	'Similar to other mapping technologies (e.g., GPS, participatory GIS), the use of drone technology has the potential to empower forest communities. Such empowerment might lead to their social and institutional strengthening and communities might then be in a much better position, for instance, to negotiate payments under REDD+ or other PES

	programs. Thus, capacity-building in this arena may help forest communities access new financial assets'. [p-12]
Limitations include the technology not being suitable to certain weather conditions such as high winds (15-25km/h) and potentially short flights. Shorter flights will not constrain the usefulness of the technology, but will require planning in order to map large areas. For example, portable charging is possible using a number of existing technologies.	Short flight endurance 'should not be a major constraint for CBFM unless a community's territory is very large. Flight times of around 50–60 min are currently feasible and can image up to 500 ha for a flight at 250 m altitude, which results in an extremely high spatial resolution of less than 10 cm per pixel side [108]. Several such missions could potentially be flown during one day from different locations within the community and thus map a relatively large area.'. [p-13]
Long-term planning and therefore securing long-term funding is necessary for the successful running of a community drone programme. Similarly, an initial requirement for training and ongoing requirement for data management would also require careful planning.	'Without securing funds and trained personnel to perform repairs and maintenance as necessary, we would expect the utilization of drones in CBFM to be severely hampered in the short-term. A well-prepared operational plan for how to deal with these contingencies is essential.' [p-14] 'communities would be very dependent on initial training and continued funding from partner organizations or government agencies. However, determining the amount of external assistance needed for community training and how much external funding is necessary requires further investigation'. [p-14]
Important safety and security issues need to be considered and discussed with the community and partner organisations.	'The operation of small drones in dangerous territories, such as community forests where illegal logging and farming, poaching, illegal drug production, land encroachment, or military activities might be taking place, may pose significant threats to the security of the drone operators, other community members, and even the partner organizations' personnel involved in the CBFM program. Although this is not a specific problem of drones, illegal actors might feel more intimidated by small drones than by people on the ground if they know of their

	surveillance capabilities (e.g., video recording)'.[p-14]
It is vital to explore the important question of 'why are we doing this' or 'why does this matter'. Everybody involved in the work should be able to answer this question, including partner organisations. By connecting often abstract actions to a wider perspective, individuals, communities and partner organisations will all have a greater sense of working towards shared goals.	'Communities must have a clear interest and commitment toward monitoring their forest resources in a "scientific" manner, particularly if they wish to participate in REDD+ or other PES programs. This approach to CBFM would not be relevant and could be antagonistic for communities that do not want to engage in externally-driven conservation programs and development projects on ideological grounds'.[p-14]
In order to ensure communities support the work and that the actions support their values, involvement and engagement from the beginning is very important.	'Engaging in drone-assisted CBFM for REDD+ or other PES projects might cause communities to lose their material and perceived autonomy as regards their socio-economic and cultural traditions (e.g., decrease of time devoted to traditional activities in farming, hunting and foraging as a result of more time spent in forest measurement and monitoring, which may be detrimental for traditional knowledge conservation [110]). Employing small drones for CBFM should thus be subject to social approval and consensus from community members prior to implementation in order to avoid or reduce potential conflicts'. [p-15]
In addition to ensuring the local communities feel empowered, local and national Governments must be involved. It could be important to ensure that Governments see community involved as a cost saving, and not perceive it as threat.	Forest communities might also be empowered by using drone technology if they retained the control of data acquisition and ownership, which could lead to their social and institutional strengthening, thus potentially improving community forest governance and opportunities to negotiate claims regarding their forest resources under REDD+ or similar programs. Drone-assisted CBFM programs should significantly contribute to the decentralization of forest data acquisition and forest management. This would be advantageous for partner organizations and governments in terms of their budget and time constraints insofar as communities retrieved forest data and adhered to the sustainable management

	strategies deemed necessary to support national and international forest conservation efforts such as REDD+
A useful strategy might be to select a small number of community members and start the project by working closely with them.	'Forest communities would need to select at least two or three community members who ideally would be computer-literate, have previous experience in managing their forest, and have good communication skills to liaise with partner organizations' personnel and other stakeholders.'[p-18]
The results of this work will have international relevance, if shared with international partners, such as the UN REDD Programme.	'The utilization of small drones in CBFM programs has significant potential co-benefits for carbon and biodiversity conservation as a result of improvements in forest monitoring and the capacity to create or enhance national forest inventories in tropical countries, which is key in REDD+ MRV systems.' [p-19]

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